

IAF SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations - IAF SPACE PROPULSION SYMPOSIUM (IP)Author: Mr. Manish Tajpuriya
NepalEFFECTS OF STRUCTURAL VIBRATION ON SPRAY PATTERN OF WELL-FUNCTIONING AND
FAULTY PINTLE-HEAD INJECTOR**Abstract**

Pintlehead injector is mostly used in liquid rocket and diesel engines. The vibration of pintlehead injector is caused due to mechanical influences and high-pressure fluid flow within the injector body. Its vibration causes the spray cone's oscillation, affecting the spray pattern and atomization efficiency. The purpose of this paper is to analyze the effect of such vibrations on spray cones and atomization of fuel. Here, the results of well-functioning and faulty injectors are also compared. Spray cone angle is determined by the geometrical parameters of the injectors like pintle tip angle(θ_{pt}), pintle tip diameter(D_{pt}) and center gap diameter(D_{cg}). The injector is designed in CATIA V5R21 and 3D printed using PLA(Polylactic Acid) for cold water flow test. The accelerometer analyzes the oscillation frequency and amplitude of the injector fixed on the injector plate and the shadowgraph technique (using high-speed camera) is used to analyze the oscillation of the spray cone. It is expected that the synchronization of flow pressure with geometrical parameters minimizes the effect of vibration providing better atomization and spray pattern. This paper helps in understanding the effects of vibrating injectors causing oscillation and poor atomization of fuel.